**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | **Response to 15-14-0350-00 and other comments** |
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| Re: | [15-14-0350-00, [STDS-802-15-10] TG10 Call Reminder for Thurs. June 5th & May 29th Mins on the TG10 reflector] |
| Abstract | [Response to the comments in 15-14-0350-00 and to comments received on the reflector regarding document #338r4] |
| Purpose | [Define the parameters to consider in the scenario for final proposals] |
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**Introduction**

This document provides responses to the comments given in 15-14-0350-00. It also addresses a comment received on the reflector on the thread **“[STDS-802-15-10] TG10 Call Reminder for Thurs. June 5th & May 29th Mins Posted**” in **orange**. The responses can be found inline in **blue.**

Comment 1: Linear topology

Add a definition for linear topology as follows:

Linear topology: transmission from the left and upper most device to the right and bottom most device by transmitting a packet to an adjacent device as shown in the figure.

For Linear Topology M = 1089 (33x33), ~~where the middle row or column has M =100~~

**We believe the picture above does not represent a linear topology. Our understanding is that linear topology was considered with use cases such as highway lighting in mind where nodes are deployed in a long row as depicted below where the PAN coordinator may be at either edge of the row or at the center of the row. We propose to either consider one row or column of the grid, or to consider a node deployment of (m x 1) of m nodes deployed in one row.**



Linear topology

Comment 2: Effects of signal quality/link quality

A measure by which effects of signal quality, link quality, and/or loss and addition of devices can be included in the scenario should be defined. From the parameters and numbers shown in the table of 15-14-0338-04, it is not easy to have a common understanding among proposers by which these effects are evaluated with the scenarios suggested.

TX power and RX sensitivity may be used for this purpose with a signal propagation model, but more detailed description to utilize these parameters should be provided.

This area should be studied further in this group. One possible way is using link failure rates to reflect these effects as proposed in 15-14-0292 and 15-14-0344.

**The received power can be derived from the propagation model. Many propagation models can be used but for simplicity we propose the two-ray model. A node decides whether the transmission can be processed by comparing the received power with the Rx sensitivity. Most network simulators (NS2, NS3, Qualnet, OPNET…) implement this feature. The network simulator derives the error probability based on a random seed and decides whether the transmission is successful or erroneous. We believe this is more realistic since the random seed portrays the varying nature of the wireless environment.**

**We are not opposed to using link failure rates, however in that case it might be more realistic to consider links other than only the adjacent and diagonal links. In real implementation it is likely that a node has more neighbors within its coverage area.**

**In the scenario for the preliminary proposals, one node’s coverage area reached up to three nodes on the grid and therefore a node had 28 neighbors. In this scenario we need to set the values of the link failure rates of the links depicted in Figure a) below. If figure a) is too complex, we can reduce the coverage area of a node and set the link failure rates as depicted in Figure b).**

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| **a)** | **b)** |

**Note: If we use fixed link failure rates instead of a propagation model and if we fix the number of neighbors, there is no need to define the Tx power, the Rx sensitivity and the node density anymore. The idea in using these three parameters was that for a certain Tx power and Rx sensitivity, the number of neighbors may vary according to node density. Using a propagation model along with these three parameters would help to evaluate the scalability of the proposal in terms of node density without having to set a link failure rate for each link when there are more neighbors. That being said, we agree to follow the consensus of the group.**

Comment 3: Packet birth rate

The worst scenario for packet birth rate is as follows:

With packet size of 2047 bytes, considering 20kbps, 1 packet has a length in the time domain

1 packet: 2047 bytes x 8 bits/byte = 16 kbits

Duty cycle of this packet 16/20 = 80% if this packet size is for the PHY layer. If it is not the case, other overhead should be considered and 1 packet/sec can be considered only data rates except 20kbps.

**Regarding the packet birth rate of 1 packet/sec, we do not have a strong objection against it but will follow the consensus of the group.**

Comment 4: Energy consumption, TX power, and RX sensitivity

More explanation on how and why these parameters are included in the scenarios can be provided so that proposers can use them for evaluation of their proposals.

**The energy consumption of the upstream and downstream scenarios corresponds to the actual energy consumption of the communication module of a smart meter manufactured by Semtech.**

**The energy consumption of the third scenario corresponds to the energy consumption of a communication module manufactured by Freescale used in a variety of applications including industrial control, automation …**

**The energy consumption is defined for each state of the node (transmitting, receiving, idle and sleeping)**

**This was done in order to use realistic values in our scenarios. The energy consumption may vary from one kind of node to another (smart meter, sensor…); however these values can be used as a reference to evaluate the overall energy consumption of the proposal.**

**Additional response to comments received on the reflector**

3. Duty **(from the thread [STDS-802-15-10] TG10 Call Reminder for Thurs. June 5th & May 29th Mins on the TG10 reflector)**

We calculated and verified if it works in the situation 1% and 0.1% duty with the packet birth rate once per 30 mins when the PHY is 100kbps. It’s up to network size but it doesn’t work in some cases.

(1% duty)

 11x11 – It work with 1/30 times/mins.

 33x33 – It should be relaxed with 1/3 times/hours

 99x99 – It should be relaxed with less than 1 times/day

(0.1% Duty)

 11x11 – It should be relaxed with 1/3 times/hours

 33x33 – It should be relaxed with less than 1 times/day

 99x99 – I think we should remove this scenario. It may work with less than once per week.

**According to clause 7.9 of the TGD, only the duty cycle of 1% is mentioned. Although duty cycles of 0.1% may exist, for the sake of simplicity of the scenario we propose to only simulate a duty cycle of 1%. The proposal should describe its behavior for a lower duty cycle.**

**Regarding the comments above in orange, it is unclear why the packet birth rate has to change for a certain duty cycle and a certain number of nodes. We believe that the proposers should use the packet birth rates as define in document #338 for all network sizes and should specify in the proposal if a packet birth rate is not supported. The proposers may specify the packet birth rate supported besides the values found in #338.**